

## CLAIMS

1. A peptide which mimics a loop on the  $\gamma$ -chain that either interact with a cytokine or a  $\gamma$ -chain partner receptor chain of a heterodimeric cytokine receptor, wherein said  
5 peptide consists of 5-25 amino acids and inhibits signal transduction mediated by cytokine:receptor binding of cytokines that bind to receptors that comprise a  $\gamma$ -chain.
2. The peptide of claim 1 wherein said peptide includes:  
SEQ ID NO:1 IQLYQTF; SEQ ID NO:2 IHLYQTF; SEQ ID NO:3 CLQYLV;  
10 SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ  
ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ  
ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH; SEQ ID NO:11  
PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13 DYRHKFSL; SEQ ID  
NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL; SEQ  
15 ID NO:17 KLSEQL or such an amino acid sequence with one or more  
conservative substitutions.
3. The peptide of claim 1 wherein said peptide includes:  
SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ ID NO:3 CLQYLV;  
SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ  
20 ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ  
ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH; SEQ ID NO:11  
PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13 DYRHKFSL; SEQ ID  
NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL or SEQ  
ID NO:17 KLSEQL.
- 25 4. The peptide of claim 1 wherein said peptide includes:  
SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ ID NO:3 CLQYLV;  
SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ  
ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ  
ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH; SEQ ID NO:11  
30 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13 DYRHKFSL; SEQ ID  
NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL; SEQ  
ID NO:17 KLSEQL or such an amino acid sequence with one or more  
conservative substitutions.

5. The peptide of claim 1 wherein said peptide is conformationally restricted.

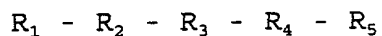
6. The peptide of claim 1 wherein said peptide is cyclic.

7. The peptide of claim 1 wherein said peptide has a cysteine residue at its N terminus and a cysteine residue at its C terminus and it is cyclized by formation of a disulfide bond between said cysteine residues.

8. The peptide of claim 1 wherein said peptide is selected from the group consisting of: SEQ ID NO:18 CIQLYQTFC; SEQ ID NO:19 CIHLYQTFC; SEQ ID NO:20 CLQYLVC; SEQ ID NO:21 CLEHLVC; SEQ ID NO:22 CLQYLTFC; SEQ ID NO:23 CLEHLTC; SEQ ID NO:24 CLQYLTQC; SEQ ID NO:25 CLEHLTQC; SEQ ID NO:26 CPIAGSSQQC; SEQ ID NO:27 CPLCGSAQHC; SEQ ID NO:28 CPLAGSAQHC; SEQ ID NO:29 CNHEPRFLSC; SEQ ID NO:30 CDYRHKFSLC; SEQ ID NO:31 CLNLQNL; SEQ ID NO:32 CLKLQNL; SEQ ID NO:33 CNLSESQLC; SEQ ID NO:34 CKLSESQLC and derivative peptides thereof.

9. The peptide of claim 1 wherein said peptide is selected from the group consisting of: SEQ ID NO:18 CIQLYQTFC; SEQ ID NO:19 CIHLYQTFC; SEQ ID NO:20 CLQYLVC; SEQ ID NO:21 CLEHLVC; SEQ ID NO:22 CLQYLTFC; SEQ ID NO:23 CLEHLTC; SEQ ID NO:24 CLQYLTQC; SEQ ID NO:25 CLEHLTQC; SEQ ID NO:26 CPIAGSSQQC; SEQ ID NO:27 CPLCGSAQHC; SEQ ID NO:28 CPLAGSAQHC; SEQ ID NO:29 CNHEPRFLSC; SEQ ID NO:30 CDYRHKFSLC; SEQ ID NO:31 CLNLQNL; SEQ ID NO:32 CLKLQNL; SEQ ID NO:33 CNLSESQLC and SEQ ID NO:34 CKLSESQLC.

10. The peptide of claim 1 wherein said peptide is a conformationally restricted peptide having the formula:



wherein:

$R_1$  is a linking moiety;

$R_2$  is 0-10 amino acids;

R<sub>3</sub> is SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH;  
5 SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13 DYRHKFSL; SEQ ID NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL; SEQ ID NO:17 KLSEQL or such an amino acid sequence with one or more conservative substitutions;

R<sub>4</sub> is 0-10 amino acids; and

10 R<sub>5</sub> is a linking moiety.

11. The peptide of claim 10 wherein:

R<sub>1</sub> is cysteine; and

R<sub>5</sub> is cysteine.

12. The peptide of claim 11 wherein:

15 R<sub>3</sub> is SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH; SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13  
20 DYRHKFSL; SEQ ID NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL; or SEQ ID NO:17 KLSEQL.

13. The peptide of claim 12 wherein:

R<sub>1</sub> is cysteine; and

R<sub>5</sub> is cysteine.

25 14. A pharmaceutical composition comprising a peptide of claim 1 and a pharmaceutically acceptable carrier or diluent.

15. The pharmaceutical composition of claim 14 wherein said peptide includes: SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5  
30 CLQYLT; SEQ ID NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ ID NO:10 PLCGSAQH; SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13 DYRHKFSL;

SEQ ID NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL;  
SEQ ID NO:17 KLSEQL or such an amino acid sequence with one or  
more conservative substitutions.

16. The pharmaceutical composition of claim 14 wherein  
5 said peptide includes: SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2  
IHLYQTF; SEQ ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5  
CLQYLT; SEQ ID NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8  
CLEHLTQ; SEQ ID NO:9 PIAGSSQQ; SEQ ID NO:36 PICGSSQQ; SEQ ID  
NO:10 PLCGSAQH; SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS;  
10 SEQ ID NO:13 DYRHKFSL; SEQ ID NO:14 LNLQNL; SEQ ID NO:15  
LKLQNL; SEQ ID NO:16 NLSESQL or SEQ ID NO:17 KLSEQL.

17. The pharmaceutical composition of claim 14 wherein  
said peptide is conformationally restricted.

18. The pharmaceutical composition of claim 14 wherein  
15 said peptide is cyclic.

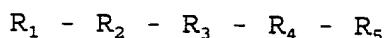
19. The pharmaceutical composition of claim 14 wherein  
said peptide has a cysteine residue at its N terminus and a  
cysteine residue at its C terminus and it is cyclized by  
formation of a disulfide bond between said cysteine residues.

20 20. The pharmaceutical composition of claim 14 wherein  
said peptide is selected from the group consisting of: SEQ ID  
NO:18 CIQLYQTF; SEQ ID NO:19 CIHLYQTF; SEQ ID NO:20 CLQYLV; C;  
SEQ ID NO:21 CLEHLV; SEQ ID NO:22 CLQYLT; SEQ ID NO:23  
CLEHLT; SEQ ID NO:24 CLQYLTQ; SEQ ID NO:25 CLEHLTQ; SEQ ID  
25 NO:26 CPIAGSSQQ; SEQ ID NO:37 CPICGSSQQ; SEQ ID NO:27  
CPLCGSAQH; SEQ ID NO:28 CPLAGSAQH; SEQ ID NO:29 CNHEPRFLS;  
SEQ ID NO:30 CDYRHKFSL; SEQ ID NO:31 CLNLQNLC; SEQ ID NO:32  
CLKLQNLC; SEQ ID NO:33 CNLSESQL; SEQ ID NO:34 CKLSESQL and  
derivative peptides thereof.

30 21. The pharmaceutical composition of claim 14 wherein  
said peptide is selected from the group consisting of: SEQ ID

NO:18 CIQLYQTF; SEQ ID NO:19 CIHLYQTF; SEQ ID NO:20 CLQYLVC;  
SEQ ID NO:21 CLEHLVC; SEQ ID NO:22 CLQYLT; SEQ ID NO:23  
CLEHLT; SEQ ID NO:24 CLQYLTQ; SEQ ID NO:25 CLEHLTQ; SEQ ID  
NO:26 CPIAGSSQQ; SEQ ID NO:37 CPICGSSQQ; SEQ ID NO:27  
5 CPLCGSAQH; SEQ ID NO:28 CPLAGSAQH; SEQ ID NO:29 CNHEPRFLS;  
SEQ ID NO:30 CDYRHKFSL; SEQ ID NO:31 CLNLQNL; SEQ ID NO:32  
CLKLQNL; SEQ ID NO:33 CNLSESQL and SEQ ID NO:34 CKLSESQL.

22. The pharmaceutical composition of claim 14 wherein  
said peptide is a conformationally restricted peptide having  
10 the formula:



wherein:

$R_1$  is a linking moiety;

$R_2$  is 0-10 amino acids;

15  $R_3$  is SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ  
ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID  
NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID  
NO:9 PIAGSSQQ; SEQ ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH;  
SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13  
20 DYRHKFSL; SEQ ID NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID  
NO:16 NLSESQL; SEQ ID NO:17 KLSEQL or such an amino acid  
sequence with one or more conservative substitutions;

$R_4$  is 0-10 amino acids; and

$R_5$  is a linking moiety.

25 23. The pharmaceutical composition of claim 14 wherein:  
 $R_1$  is cysteine; and  
 $R_5$  is cysteine.

24. The pharmaceutical composition of claim 23 wherein:  
 $R_3$  is SEQ ID NO:1 IQLYQTF; SEQ ID NO: 2 IHLYQTF; SEQ  
30 ID NO:3 CLQYLV; SEQ ID NO:4 CLEHLV; SEQ ID NO:5 CLQYLT; SEQ ID  
NO:6 CLEHLT; SEQ ID NO:7 CLQYLTQ; SEQ ID NO:8 CLEHLTQ; SEQ ID  
NO:9 PIAGSSQQ; SEQ ID NO:36 PICGSSQQ; SEQ ID NO:10 PLCGSAQH;  
SEQ ID NO:11 PLAGSAQH; SEQ ID NO:12 NHEPRFLS; SEQ ID NO:13

DYRHKFSL; SEQ ID NO:14 LNLQNL; SEQ ID NO:15 LKLQNL; SEQ ID NO:16 NLSESQL; or SEQ ID NO:17 KLSEQL.

25. The pharmaceutical composition of claim 24 wherein:  
R<sub>1</sub> is cysteine; and  
5 R<sub>5</sub> is cysteine.

26. A method of inhibiting signal transduction mediated by cytokine:receptor binding of cytokines that bind to receptors that comprise a  $\gamma$ -chain, said method comprising the step of administering an effective amount of a peptide of claim 1.  
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27. A method of inhibiting cytokine mediated cell growth, proliferation, function or activity comprising the step of contacting said cell with an peptide of claim 1.

28. A method of treating a patient suffering from a disease disorder or condition characterized by cytokine mediated cell growth, proliferation, function or activity comprising the step of administering to said patient a therapeutically effective amount of a peptide of claim 1.  
15

29. A method of treating a patient suffering from a disease disorder or condition characterized by cytokine mediated cell growth, proliferation, function or activity comprising the step of administering to said patient a therapeutically effective amount of a peptide of claim 1, wherein said patient has lymphoma, leukemia, an allergic reaction, an autoimmune disease, graft versus host disease or rejection of a transplant or graft.  
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30. A method of preventing a condition characterized by cytokine mediated cell growth, proliferation, function or activity in a patient identified as being at risk of such a condition comprising the step of administering to said patient a prophylactically effective amount of a peptide of claim 1.  
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31. A method of preventing a condition characterized by cytokine mediated cell growth, proliferation, function or activity in a patient identified as being at risk of such a condition comprising the step of administering to said patient  
5 a prophylactically effective amount of a peptide of claim 1, wherein said patient is at risk of an allergic reaction, graft versus host disease or rejection of a transplant or graft.